

## A SURVEY AMONG NUTRITIONAL ANAEMIA IN PREGNANCY PREGNANT AND NON-PREGNANT WOMEN IN A RURAL DISTRICT OF WESTERN-JAVA, INDONESIA. x)

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*Penyelidikan ini dilakukan didaerah pegunungan di Jawa Timur pada masyarakat dengan penghasilannya rendah, untuk mengetahui sampai berapa jauh anemia terdapat pada ibu hamil maupun pada wanita dewasa normal.*

*Ternyata 60 - 85 per cent dari seluruh wanita yang hamil maupun tidak hamil menderita nutritional anemia ringan maupun sedang. Sedangkan bagi mereka yang mempunyai nilai haemoglobin rendah tidak harus selalu diikuti dengan rendahnya kadar protein serum, Packed Cell Volume, maupun serum iron.*

*Hal ini mungkin dapat diterangkan karena adanya beberapa makanan yang dipantang sewaktu hamil dan juga oleh karena 80 per cent dari total kalori yang didapat adalah berasal dari beras dan 6 - 7 per cent kalori lainnya berasal dari ikan asin.*

*Satu-satunya sumber protein mereka adalah juga dari ikan asin.*

*Dari hasil penyelidikan Tjiat dan Soedarmo di Rumah Sakit Umum Jakarta didapat juga hasil bahwa 50 per cent dari ibu-ibu hamil menderita anemia ringan, 40.0 per cent anemia sedang, dan 9.0 per cent anemia berat yang kesemuanya itu disebabkan oleh karena nilai gizi makanan mereka yang kurang.*

Nutritional anaemia has been defined as a condition in which the haemoglobin content of the blood is lower than normal, due to a deficiency of whatever cause, of one or more essential nutrients for erythropoiesis. Attention has to be called to the problem of anaemias of pregnancy, which has been considered to be of great public importance, particularly in developing countries.

Results of the nutritional studies in pregnancy carried out by Tjiat and Soedarmo at the General Hospital, Jakarta, were that more than 50 per cent of the cases showed an insufficient food intake and the haemoglobin levels were rather below normal. Tjiong found

that 50 per cent of the pregnant women were suffering from mild anaemia, 40.0 per cent from moderate and 9.0 per cent from severe anaemia.

It is necessary to get data to what extent nutritional anaemia in pregnancy occurs in Indonesia, especially in the rural areas. A near by rural area, from the Nutrition Research Institute Bogor, has been chosen to make this study possible. This study was supported by the five year's development plan of the Indonesian Government.

### MATERIALS AND METHODS.

The suitable village had an altitude below 1000 m. There were 100 pregnant women, spread out over the village. As a control group 100 non-pregnant women of child bearing age, neighbours of the pregnant women were taken. The husbands were labourers, farmers or retailers and could be classified in the low income group.

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Clinical examination was done to obtain clinical findings of anaemia (4). Stool examinations were performed for the determination of ova or cysts of the intestinal parasites.

At the same time capillary blood was drawn. The cyanmethemoglobin technique was used for haemoglobin determination. Packed cell volume was determined using heparinized microtubes. Serum iron and total iron binding capacity were determined by the Ramsay method. Total serum protein was done according to the Biuret method. (D.O. Brein & Frank A. Ibbott 1962; W.S. Sinamora 1961).

The weighing method was used for dietary survey. All food were weighed during three

were used occasionally by some families in very small amounts.

Vegetables were not consumed as many as one would expect. Fruit was not regularly consumed.

Table 2 shows the composition of the average daily diet calculated from the Indonesian food composition table. Rice furnished about 80 per cent of the total calories in both groups and 6–7 per cent of the total calories came from salted dried fish, the only source of animal protein.

Figure illustrates the percentage deviation from the Indonesian recommended dietary allowances for calories, protein, calcium, iron, etc.

Table 1. The average daily food consumption (in grams, edible portion)

Kinds of food	Pregnant women x)			Non-pregnant women N 69
	Trimester 1	Trimester 2	Trimester 3	
	N 20	N 30	N 28	
Rice	289	293	274	322
Other cereals	3	6	1	3
Roots and tubers	21	12	21	13
Dried salted fish	19	23	17	19
Fresh fish	1	1	1	1
Meat	8	2	9	3
Eggs	2	1	2	4
Beans, nuts and those products	27	20	29	39
Vegetables	67	71	88	71
Fruits	21	144	22	—
Oils and fats	9	6	11	10
Sugar	5	2	5	4

x) Findings for second third trimester were not obtained from longitudinal observations, they represent the cross sectional outcome of all pregnant women, divided in subgroups trimester 1, 2 and 3.

Fat was mostly from coconut oil.

Some food were prohibited during pregnancy, due to the local customs. During the third trimester of pregnancy the amount of rice, roots, tubers, meat and egg were limited, days for each sample. The amount of the individual nutrients was calculated from the Indonesian food table.

## RESULTS AND DISCUSSION.

### Dietary Study.

Table 1 shows the average daily food consumption. It shows that rice was the staple. The main source of animal protein food was dried salted fish. Fresh fish, eggs and meat

Table 2. Average daily calorie and nutrient intake

Nutrients	Pregnant women x)			Non-pregnant women N = 59
	Trimester 1	Trimester 2	Trimester 3	
	N = 20	N = 30	N = 28	
Calorie	1346	1265	1273	1434
Total protein (g)	37.5	33.5	35.5	39.7
Animal protein (g)	9.1	9.2	9.9	9.4
Fat (g)	15.7	19.8	18.3	17.4
Calcium (mg)	206	218	217	246
Iron (mg)	8.6	8.1	9	9.8
Vit. A., Carotene (I.U.)	2916	2459	2686	2244
Vit. B <sub>1</sub> (mcg)	780	549	584	874
Vit. C (mg)	20	18	22	21

x) See note at Table 1.

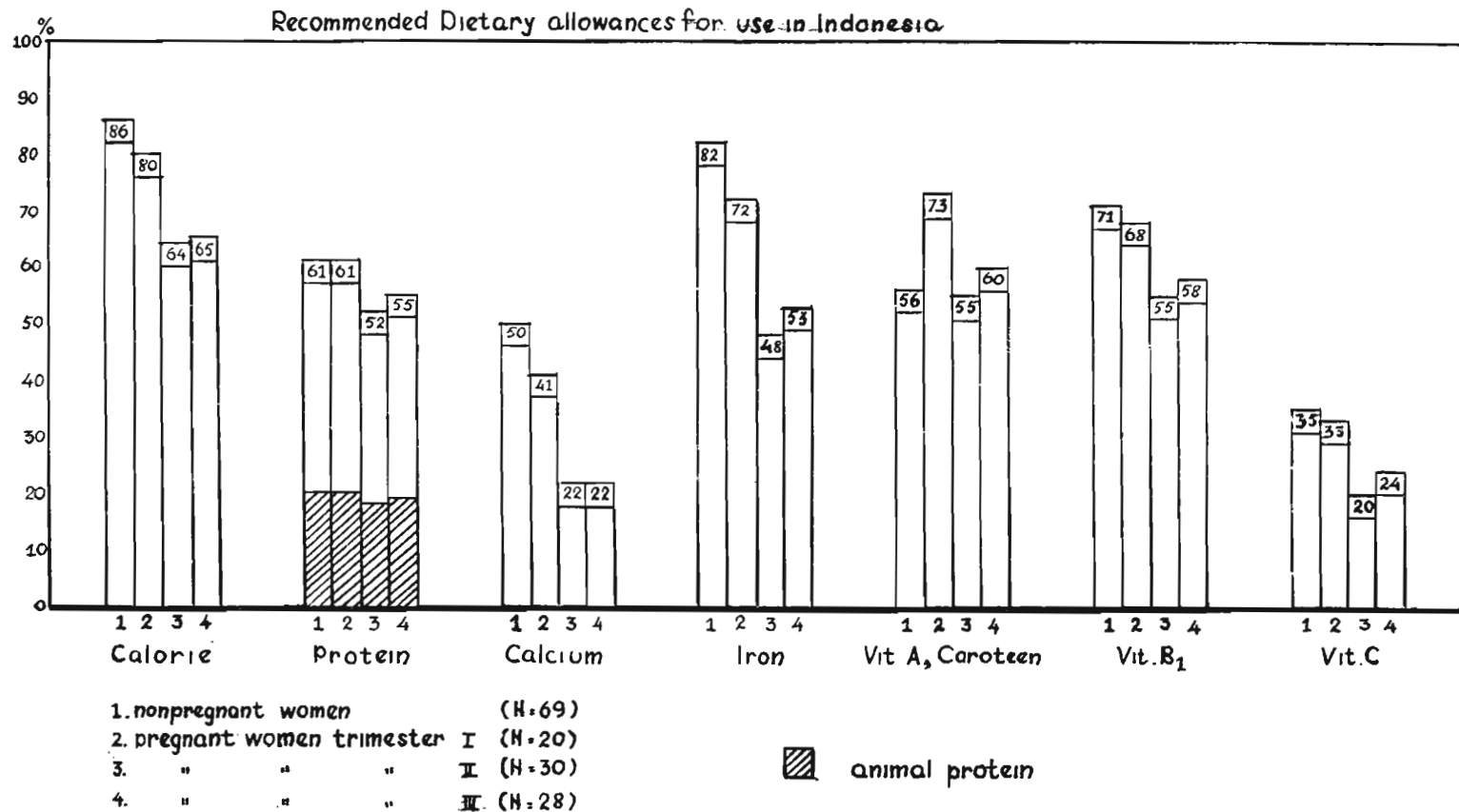
Most of the women had a very low food intake. The food consumed during pregnancy was lower than for the non-pregnant state. The main short comings were estimated for calcium and vitamin C.

Blood examinations.

Haemoglobin (Hb).

Tjong considered anaemia with a Hb level lower than 10g per cent during pregnancy and 11.5g per cent for the non-pregnant state. In pregnancy between 8–10 g per cent was considered to reflect mild anaemia and lower than 8 g per cent was either moderate or severe. In the non-pregnant state 10–11.5 g per cent was considered mild anaemia and lower than 10 g per cent moderate or severe. Corresponding borderline values for packed cell volume might be obtained by multi-

Fig. Adequacy of calorie and nutrient intake of the pregnant and the nonpregnant women in percentage of the Recommended Dietary allowances for Indonesia.



plying by three the haemoglobin levels mentioned above.

In this study the same criterions were used.

Table 3: there was a high prevalence of mild anaemia irrespective of being pregnant (57 per cent) or not (45 per cent), and a

considerable number of cases had moderate or severe anaemia, during pregnancy (16 per cent) and even so in the non-pregnant state (33 per cent). If the criterion of W.H.O. was used, the anaemia cases were higher: 97 – 100 per cent during pregnancy and 88 per cent in the non-pregnant state.

Table 3. Haemoglobin levels with low serum iron and low serum protein levels

Haemoglobin levels (g/100 ml)	Pregnant women x)									Non-pregnant women		
	Trimester 1			Trimester 2			Trimester 3					
	N = 22	a	b	N = 38	c	d	N = 40	c	d	N = 84	a	b
6 and less	—	—	—	1	1	1	—	—	—	—	—	—
6.1 – 7	—	—	—	—	—	—	3	3	1	1	1	—
7.1 – 8	—	—	—	2	1	2	1	1	—	2	2	—
8.1 – 9	2	1	2	4	3	1	13	3	7	12	5	4
9.1 – 10	7	4	5	17	1	8	15	1	5	13	2	5
10.1 – 11	8	3	3	12	1	6	7	1	4	28	5	15
11.1 – 12	5 <sup>1)</sup>	—	3	1	—	1	1	—	1	18 <sup>2)</sup>	2	8
12.1 – 13	—	—	—	—	—	—	—	—	—	9	—	2
13.1 – 14	—	—	—	—	—	—	—	—	—	1	—	—
Average hemoglobin level	10.3 ± 0.9			9.6 ± 1.1			9.1 ± 1.1			10.5 ± 1.4		
Mild and moderate anemia (per cent)	86			65.6			80			78.5		
Anemia, criterion of WHO (per cent)	100			97			97			88		

a = serum iron less than 60 mcg per cent;

b = serum protein less than 7 g per cent;

c = serum iron less than 50 mcg per cent;

d = serum protein less than 6.5 g per cent;

1) 2 women with hemoglobin less than 11.5 g/100 ml;

2) 10 women with hemoglobin less than 11.5 g/100 ml;

x) see note under table 1.

From this table it appeared that:

- about 90 – 100 per cent of the non-pregnant as well as of the pregnant women with low S.I. (lower than 50 mcg per cent during pregnancy, less than 60 mcg per cent in the non-pregnant, state had also subnormal Hb;
- but between 50 – 73 per cent of the non-pregnant as well as of the pregnant women with low Hb had normal serum irons.

The number of low serum protein (S.P.) values (lower than 6.5 g per cent in pregnancy and lower than 7 g per cent in the non-pregnant state) occur all over the range of low as well as normal Hb's:

- about 42 – 60 per cent of the pregnant and the non-pregnant women with low serum protein had also low Hb;
- but about 35 – 60 per cent of the pregnant and the non-pregnant women with normal Hb had low serum protein.

Table 4. Several hematocrit values with other blood components

Hematocrit values (percent)	Pregnant women x)												Non-pregnant women			
	Trimester 1				Trimester 2				Trimester 3							
	N = 22	a	b	c	N = 38	d	e	f	N = 40	d	e	f	N = 84	a	b	c
25 - 28	—	—	—	—	4	4	1	4	1	1	1	—	—	—	—	—
29 - 32	1	1	—	1	9	9	2	6	9	9	2	4	6	5	4	1
33 - 36	8	8	5	4	12	8	—	3	20	16	5	11	27	25	7	11
37 - 40	12	9	3	6	8	4	1	4	6	3	—	5	38	26	6	16
41 - 45	1	1	—	—	—	—	—	—	—	—	—	—	13	10	—	—
Average hematocrit (per cent)	37.5 ± 2.9				33.8 ± 3.1				33.9 ± 2.9				37.3 ± 3.2			

x) See note at table 1

a = hemoglobin less than 11.5 g/100 ml;

b = serum iron less than 60 mcg per cent;

c = serum protein less than 7 g per cent;

d = hemoglobin less than 10 g/100 ml;

e = serum iron less than 50 mcg; per cent;

f = serum protein less than 6.5 g per cent;

Table 5. Several serum iron values with other blood components

Serum iron values (mcg)	Pregnant women x)									Non-pregnant women		
	Trimester 1			Trimester 2			Trimester 3					
	N = 21	a	b	N = 38	c	d	N = 39	c	d	N = 81	a	b
Less than 20	—	—	—	2	2	2	—	—	—	—	—	—
21 - 30	—	—	—	—	—	—	2	2	2	1	1	1
31 - 40	1	—	—	1	1	1	1	1	1	1	—	1
41 - 50	2	2	1	1	—	—	6	5	5	12	11	12
51 - 60	6	2	1	6	6	1	6	5	4	3	3	3
61 - 70	2	2	2	7	4	—	10	8	3	8	7	—
71 - 80	3	1	2	9	6	—	9	8	—	18	13	—
81 - 90	2	—	—	8	4	—	3	2	—	15	13	—
91 - 100	2	1	—	4	2	—	1	—	—	9	5	—
101 - 110	2	—	—	—	—	—	1	—	—	9	8	—
111 - 120	1	—	—	—	—	—	—	—	—	5	2	—
Average serum iron	72.6 ± 27.3			70.2 ± 18.8			63.6 ± 19.9					
Anemi with iron depletion (percent)	28			10			38					

x) See note at table 1.

a = hemoglobin less than 11.5 g/100 ml;

b = transferrin saturation percentage less than 18 per cent;

c = haemoglobin less than 10 g/100 ml;

d = transferrin saturation percentage less than 15 per cent;

Table 6. Several total iron binding capacity values with other blood component

T.I.B.C. values (mcg/100 ml)	Pregnant women x)												Non-pregnant women			
	Trimester 1				Trimester 2				Trimester 3							
	N = 21	a	b	c	N = 38	d	e	f	N = 39	d	e	f	N = 81	a	b	c
200 – 249	3	3	1	—	2	—	—	—	—	—	—	—	11	7	1	1
250 – 299	7	6	3	—	3	3	—	—	1	1	—	—	21	15	4	1
300 – 349	6	5	2	1	14	9	1	—	12	10	2	1	38	31	7	6
350 – 399	6	5	2	2	15	11	1	2	18	13	4	5	12	12	4	3
400 – 449	—	—	—	—	2	1	—	1	4	4	2	4	—	—	—	—
450 – 500	—	—	—	—	2	1	1	—	4	3	—	1	—	—	—	—
Average T.I.B.C. mcg/100 ml	314.4 ± 16.3				347.1 ± 53.2				371.1 ± 75.9				307 ± 48.5			

x) See note at table 1.

a = hemoglobin less than 11.5 g/100 ml;

b = serum iron less than 60 mcg per cent;

c = transferrin saturation percentage less than 18 per cent;

d = hemoglobin less than 10 g/100 ml;

e = serum iron less than 50 mcg per cent;

f = transferrin saturation percentage less than 15 per cent;

### Packed cell volume.

Table 4: Up to P.V.C. 36 per cent all bloods have low Hb's, but from a P.C.V. of 36 per cent and more both normal and low Hb concentrations occur frequently. Low S.I.'s and low serum proteins occur all over the range of P.C.V.'s.

### Serum iron (S.I.).

Table 5: The low Hb levels are spread all over the range from low to the higher levels for S.I. Thus there were many anaemic women, who had normal S.I.'s as well as normal saturation percentages.

### Total iron binding capacity (T.I.B.C.)x)

Table 6: Again low Hb's and low S.I.'s occurred all over the range from the lowest T.I.B.C. till 500 mcg/100 ml, but many of the samples which showed iron depletion (transferrin saturation percent less than 15 per cent and less than 18 per cent) had normal or even low iron binding capacities.

Only few of the blood samples had this high T.I.B.C. in the second and third trimester of pregnancy. Therefore the many mild ana-

mias coinciding with low and normal binding capacities most probably indicated protein deficiency as a cause of anaemia in this survey, when infection could be excluded.

### Clinical examination.

All of the women examined were not reported as sick and did their ordinary daily work. Table 7 gives a picture of the results of the clinical examination.

The high prevalence of mild and moderate anaemia as was characterized in first instance during this screening by the finding of 60 to 85 per cent low and borderline haemoglobin levels, most probably due to a multiple nutritional cause. The vast majority of the pregnant and non-pregnant women surveyed in this study live on a diet containing far less calories and in particular far less animal protein than was considered necessary for the maintenance of health.

The supply of vitamin C in this survey was very poor indeed, which could have contributed to folic acid deficiency anaemia among these groups.

Table 7 Summary of the clinical examination

Subjects examined	Pregnant women			Non-pregnant women (N = 84)
	Trimester 1 (N = 22)	Trimester 2 (N = 37)	Trimester 3 (N = 40)	
Clinical examination (per cent of subjects)				
— blood pressure 135/90	5	14	8	12
— heart murmur	—	—	—	1
— jaundice	—	3	—	—
— complaints of weakness, giddiness, anorexia or dyspnoea	45	8	8	5
— conjunctival pallor	14	33	33	21
— angular cheilosis	14	3	5	7
— goitre	—	—	—	4
Intestinal parasites (per cent of subjects)				
none	9	4	3	18
Ascaris lumbricoides	47	52	65	57
Hookworms	—	—	2	—
Trichuris trichiura	5	—	9	3
Entamoeba coli	14	11	12	15
Entamoeba histolytica	14	26	12	12
Others non-pathogenic	56	48	70	59

Megaloblastic anaemia with or without evidence of iron deficiency would probably be found in many patients with Hb levels of 9 g per cent or less.

Mild anaemia was certainly not the earliest sign. Iron depletion (without anaemia) might effect both the health of the mother during pregnancy and the development of the unborn child, before anaemia as a clinical manifestation could be diagnosed.

### Summary.

This study on nutritional anaemia in pregnancy dealt with dietary and socio economic survey, clinical examination, blood determination of 99 pregnant and 84 non-pregnant women from low income group at village Bendungan.

There was not much variety in the kind of food consumed. Rice furnished about 80 per cent of the total calories in both groups and 6–7 per cent of the total calories come from salted dried fish, the only animal protein source. There was an inadequate intake when compared with the Indonesian Recommended Dietary Allowances.

All of the women examined were not re-

ported as sick and did their ordinary daily work.

Not all low Hb values were correlated with low serum protein levels, low serum iron or low P.C.V. The coincidence of low serum protein with both low and normal Hb values suggested that protein undernutrition was another contribution to the occurrence of mild anaemia irrespective of iron. The average of the transferrin saturation percentage was on the borderline level.

It could be assumed that there was a high prevalence of mild and moderate nutritional anaemia (60 to 80 per cent) among the pregnant and non-pregnant women in this village.

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